UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/532,656	04/26/2005	Harry Vig	011-03US1	6265

36522 7590 11/03/2009

MAGIQ TECHNOLOGIES, INC
171 MADISON AVENUE, SUITE 1300
NEW YORK, NY 10016-5110

EXAMINER	
VAUGHAN, MICHAEL R	

ART UNIT	PAPER NUMBER
2431	

MAIL DATE	DELIVERY MODE
11/03/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/532,656	Applicant(s) VIG ET AL.	
	Examiner MICHAEL R. VAUGHAN	Art Unit 2431	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 13 August 2009.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-20 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

The instant application having Application No. 10/532,656 is presented for examination by the examiner. Claims 1-20 are pending. Claims 1, 3, 6-9, and 11-13 are amended.

Response to Amendment

Claim Objections

Claim 11 is objected to because there is still an “and/or” present.

Claim Rejections - 35 USC § 112

Claim amendments overcome the previous 112 rejection.

Response to Arguments

Applicant's arguments filed 8/13/09 have been fully considered but they are not persuasive. Applicant has argued that Townsend fails to teach sending the quantum signals while not being interrupted by the timing signals. Townsend teaches this limitation but Applicant has argued that the suggestion is not fully enabled. Examiner respectfully disagrees.

MPEP 2131.01 lists three proper reasons multiple references can be used in a 102 rejection. One of which is to prove a reference contains an "enabled disclosure". Applicant contests the notion that the multiplexing of timing signals with the quantum information is not enabled in Townsend. It appears the Applicant is only reading the cited portion of Townsend (col. 8, lines 51-57). However, Townsend fully enables this alternative approach of using WDM in the following column (9) and specifically points to Figure 7 for more support. Column 9, lines 23-43 elaborate on the teaching of using a common medium to continuously send both the timing/calibration signals with the quantum data and having different wavelength detectors to separate the signals. If this is not adequate proof of enablement, USP Application Publication 2004/0151321 to Lutkenhaus, filed before the instant invention, described in its background that the Townsend reference teaches the above limitation. Lutkenhaus mentions

> [0037] Another possibility is to send the time sequencing signal simultaneously with the information signal in the same medium. For example, the time sequence signal can be at a wavelength different from the information signal, or it may be a signal of any wavelength transmitted a predetermined time in advance or after the information signal. Wavelength division multiplexing can be employed by combining the signals from the quantum channel, timing channel, and a public channel into a common medium, as described in Townsend U.S. Pat. No. 5,675,648.

This Lutkenhaus application filed in 2002 shows that this limitation was known in the public domain and enabled by Townsend before the instant invention was filed.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Townsend et al. (US 5,675,648).

As per claim 1, Townsend teaches the limitation of “establishing in each QKD station respective receive and transmit time domains that are connected between the QKD stations via a timing channel” (column 1, lines 57-60) as a calibration signal is transmitted over the public channel to calibrate the system for the transmission of a key on the quantum channel, where (column 2, lines 19-22) the calibration step preferably includes transmitting a clock from the transmitter to the receiver on the public channel to provide timing information for the subsequent decoding of a key transmitted on the quantum channel.

In addition, Townsend teaches the limitation of “transmitting in a continuous mode from the first station to the second station quantum signals emitted by a laser source over a quantum channel connecting the first and second stations” (col. 9, lines 35-42) as a key is distributed on a quantum channel.

Further, Townsend teaches the limitation of “transmitting over the timing channel optical synchronization signals over a timing channel connecting the first and second QKD stations from respective optical transmitters and over the timing channel, without interrupting the transmission of the quantum signals” (column 6, line 65 – column 7, line 2) as the different channels can be separated by means of wavelength-dependent fiber couplers and optical fibers. In this case the clock and calibration information can be transmitted continuously during the quantum transmission.

Furthermore, Townsend teaches the limitation of “the optical synchronization signal to include frame sync pulses and data pulses” (column 5, lines 50-53) as the transmitter and receiver communicate on public channel to exchange information on which encoding/decoding alphabets were used for giver signal pulses. In addition, (column 5, lines 57-59) as in addition to use for public discussion stage of the protocol, the public channel is also used to calibrate the transmission system.

Finally, Townsend teaches the limitation of “coordinating transmission of the quantum signals, encoding of the quantum signals and detecting of the encoded quantum signals by locking the receive and time domains of the two QKD stations using the optical synchronization signals in order to establish a key between the two QKD stations” (column 6, lines 41-56) as the quantum key distribution system used in the present example has [...] the protocol that requires that transmitter and receiver must correlate the sent and received data for each pulse time-slot. This function can be performed by the calibration process. During this process, the amplified output from the public channel detector is input to the clock regeneration module. This contains an

electronic filter that produces an oscillating signal at the pulse repetition frequency which is used to lock a local oscillator to the optical source or master clock frequency. This local oscillator is then used to provide the timing information required by the receiver during the quantum transmission stage of the protocol. Furthermore, (column 6, line 65 – column 7, line 5) as the different channels can be separated by means of wavelength-dependent fiber couplers and optical fibers. In this case the clock and calibration information can be transmitted continuously during the quantum transmission. Lutkenhaus teaches [0037] that Townsend discloses simultaneously sending the timing signals with the quantum signals. This shows the quantum signals are not interrupted by the timing signals.

With respect to claim 2, Townsend teaches the limitation of “multiplexing the quantum signals and sync signals onto a common transmission medium linking the first and second QKD stations” (column 2, lines 34-39) as a quantum channel and a public channel are transmitted over a common transmission medium, and in that a clock signal is transmitted over the public channel from a transmitter to a receiver to provide timing information for the subsequent decoding of a key transmitted on the quantum channel.

With respect to claim 10, Townsend teaches the limitation of “electronically adjusting the transmitting and receiving domains in each QKD station to compensate for time delays introduced in at least one of the quantum channel and timing channel” (column 6, lines 27-28) as after some characteristic time the system needs to be re-calibrated. Furthermore, (column 6, lines 56-62) each time the transmission system is re-calibrated via the public channel, the local oscillator is re-timed so as to avoid

accumulation of any timing errors. The frequency with which re-calibration needs to be carried out is determined by the shorter of the two time constants associated with the stability of the local oscillator and the transmission channel.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Townsend et al. (US 5,675,648) (648) in view of Townsend et al. (US 5,768,378) (378).

With respect to claim 3, it is noted that Townsend (648) does not explicitly teach the limitations of “generating an electrical sync signal from an FPGA”, “receiving the electrical sync signal at an optical transmitter”, and “converting the electrical sync signal to the optical sync signal.”

On the other hand, Townsend (648) teaches (Fig. 4, item 48, 49, and 50) Modulator Driver coupled to a semiconductor laser and a microprocessor, where (column 4, lines 39-40_ the laser and the modulator driver are controlled by the microprocessor.

In addition, Townsend (378) teaches (Fig. 5a, items 52, 53, and 55) Data + Clock Generator 53 coupled to a semiconductor laser 52 and a microprocessor 53, where (column 7, lines 56-58) semiconductor laser 52 provides a bright multi-photon source which is used for timing and calibration.

Furthermore, the use of FPGA to generate synch signal is well known in the art. It would have been obvious to one of the ordinary skill in the art at the time of the invention to incorporate the Data + Clock Generator taught by Townsend (378) into the system of Townsend (648) to provide independent robust control unit for modulating data and timing signals.

Furthermore, the use of FPGA to generate synch signal is well known in the art. Therefore, it would have been obvious to one of the ordinary skill in the art at the time of the invention to implement the functionality of Data + Clock Generator using FPGA because of the ease and low cost of design and manufacturing.

Claims 4, 5, 12, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Townsend et al. (US 5,675,648) in view of Piasecki et al. (US 5,111,451).

With respect to claim 4, Townsend teaches “sending the sync signals between a first the first QKD station and the second QKD station”, “an optical transmitter and an optical transceiver”, and “timing channel” (Fig.4, items 1, 2, and 3) optical transmitter

and optical receiver coupled via transmission fiber that is used for transmitting quantum channel and public channel.

It is noted, however, that Townsend does not explicitly teach the structure where the abovementioned transmitter and transceiver comprise the parts of the first optical modem in the first QKD station and a second optical modem in the second QKD station, wherein the first and second optical modems each have an optical transmitter and an optical transceiver coupled to a circulator, and wherein the circulators are connected to the timing channel."

On the other hand, Piasecki teaches such optical modem structure (Fig. 2; column 4, 21-22) as a diagram of each of the optical modems.

The structure of the optical modem is well known in the well known in the art. Therefore, it would have been obvious to one of the ordinary skill in the art at the time of the invention to incorporate transmitter and receiver into the same system to provide the ability for each participant to both transmit and receive data over the optical fiber medium.

With respect to claim 5, Townsend teaches the limitation of "coordinating the operation of the optical transmitters and optical receivers in the first and second modems with first and second phase-lock loops (PLLs) in the first optical modem, and a third PLL and a transmit clock in the second optical modem" (column 6, lines 1-5) as a polarization compensator in the receiver in then adjusted via a feedback loop in order to

liberalize the output polarization an match it to the preferred polarization axis of the receiver.

As per claim 12, Townsend teaches a timing system for a QKD system having a first and second QKD stations the system comprising:

Laser-based optical transmitter and a receiver with an optical detector (col. 4, lines 35-40); and a controller in each QKD station and being adapted to transmit and receive sync signals over a timing channel to sync the quantum transceivers wherein the synch signals include frame sync pulses and data pulse (col. 6, lines 45-55). Townsend does not explicitly use the word transceiver or modem. Piasecki teaches the use of optical modem synchronization through optical channels. It would have been obvious to use optical modems in Townsend system because if one of ordinary skill wanted to send and receive he/she could have seen that a modem would be equivalent to putting both the transmitter and receivers of Townsend into one package. Examiner finds it obvious that an apparatus which combined the transmitter and receiver of Townsend and which sent signal over a optical channel is essentially the same as a optical modem and transceiver. Townsend is silent in disclosing each modem has a first and second PPL and clock coupled. Townsend does teach coupled a clock to the transmitter. Piasecki teaches the use of a PPL in conjunction with keeping signals in sync (col. 5, lines 5-10). Examiner supplies the same rationale for combining Piasecki with Townsend above. If one is using a modem, it is then obvious you need the PPL to keep signals in sync.

Claims 6, 7, 11, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Townsend et al. (US 5,675,648) in view of Bennett (US 5,307,410).

With respect to claim 6, it is noted that Townsend does not explicitly teach the limitations of “generating random numbers from a random number generation unit having a plurality of data sources that generate data and that are coupled to a data source selector”, “selecting one of the data sources using the data source selector”, and “delivering the data from the selected data source to a modulator driver.”

On the other hand, Bennett teaches the abovementioned limitations (column 5, lines 14-19) as a random number generator coupled over lead to an input of controller. Random number generator functions to create true random number which may be used by controller to set the phase of the plurality of light pulses passing through phase modulator.

It would have been obvious to one of the ordinary skill in the art at the time of the invention to incorporate teachings of Bennett into the system of Townsend to provide a simple way of managing phase shift of the transmitted light signal providing greater security for data transmission.

With respect to claim 7, Townsend does not explicitly teach the limitations of "providing a gating signal to the modulator driver that coordinates the activation of the modulator driver with the arrival of one of the quantum signals at the modulator based on the synchronization signals" and "encoding the quantum signal with the modulator."

On the other hand, Bennett teaches the abovementioned limitations (column 5, lines 4-19) as the lower intensity light pulse passing forward into the phase modulator. Phase modulator functions to introduce or set the phase of a coherent light pulse from pulsed light source. The phase shift is chosen randomly from a fixed set of possible values. Controller provides a control signal over lead to phase modulator to set the phase of the coherent light pulse passing through phase modulator. Random number generator is coupled over lead to an input of controller. Random number generator functions to create true random number which may be used by controller to set the phase of the plurality of light pulses passing through phase.

It would have been obvious to one of the ordinary skill in the art at the time of the invention to incorporate teachings of Bennett into the system of Townsend to provide a simple way of managing phase shift of the transmitted light signal providing greater security for data transmission.

With respect to claim 11, Townsend teaches the limitation of "a quantum transceiver coupled to a quantum channel, the quantum transceiver having a modulator driver and a modulator, and adapted to transmit and/or receive quantum signals over the quantum channel" and "an optical modem adapted to send and receive optical synchronization signals over a timing channel, the optical modem having an optical

receiver and an optical transmitter both coupled to a circulator, which is coupled to the timing channel" (Fig. 4, items 49, 41).

Lutkenhaus teaches [0037] that Townsend discloses simultaneously sending the timing signals with the quantum signals. This shows the quantum signals are not interrupted by the timing signals.

It is noted, however, that Townsend does not explicitly teach the limitations of "a random number generator (RNG) unit coupled to the quantum transceivers, the RNG unit adapted to provide random numbers to the quantum transceiver so as to randomly encode a quantum signal passing through the modulator", "a public data transceiver (PDT) coupled to the RNG unit, the quantum transceiver and to a public channel", and "a controller coupled to optics layer, the RNG unit and the optical modem, wherein the controller in one QKD station is adapted to synchronize the operation of the quantum transceiver and the RNG unit in the one station to the quantum transceiver and RNG unit of the other QKD station based on synchronization signals communicated between the controllers through respective optical modems via the timing channel without interrupting the transmitting and/or receiving of quantum signals over the quantum channel"

On the other hand, Bennett teaches the abovementioned limitations (Fig. 2, items 36, 46, 18, 20, 40).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to incorporate teachings of Bennett into the system of Townsend to provide a

simple way of managing phase shift of the transmitted light signal providing greater security for data transmission.

As per claim 20, Townsend teaches the sync signals include frame sync pulses and data pulse (col. 8, lines 49-50)

Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Townsend et al. (US 5,675,648) in view of Gisin et al. (US 6,438,264 B1).

With respect to claims 8 and 9, it is noted that Townsend does not explicitly teach the limitations of “forming from the quantum signal first and second quantum pulses at the first QKD station and transmitting the quantum pulses over the quantum channel to the second QKD station”, “at the second QKD station, randomly modulating one of the quantum pulses and attenuating the quantum pulses to form weak quantum pulses”, “sending both pulses to back to the first QKD station via the quantum channel”, and “randomly modulating the unmodulated pulse at the first QKD station.”

On the other hand Gisin teaches the abovementioned limitations (column 3, lines 15-32) as Bob initiates the transmission by sending a short laser pulse toward Alice. The pulse arriving at the coupler is split into two parts. Two pulses travel down the fiber to Alice. In order to encode her bits, Alice lets the first pulse be reflected by the mirror, but modulates the phase of the second pulse. Two pulses then travel back to Bob. Bob lets the second pulse unaltered, but modulates the phase of the first pulse.

It would have been obvious to one of the ordinary skill in the art at the time of the invention to incorporate teachings of Gisin into the system of Townsend to provide a more reliable method for detecting interference.

Claims 13-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Townsend et al. (US 5,675,648) in view of Piasecki and in view of Bennett.

As per claim 13, Townsend teaches a first and second QKD stations each having a quantum transceiver with first laser, a public data transmission unit, and a controller, all operably interconnected within each QKD station (col. 5, lines 50-60);

b) a quantum channel connecting the quantum transceivers (col. 5, lines 50-51), which are configured to exchange frames of quantum signals over the quantum channel (col. 6, lines 20-26) in a continuous mode (col. 8, lines 48-52);

c) a public channel connecting the public data transmission units (col. 5, lines 51 54);

d) a timing channel connecting the optical modems, which each include a second laser for generating optical synchronization signals for transmission in a continuous-mode over the timing channel (col. 9, lines 35-43). Lutkenhaus teaches [0037] that Townsend discloses simultaneously sending the timing signals with the quantum signals. This shows the quantum signals are not interrupted by the timing signals. Examiner relies on the same rationale as stated above for combining the RNG of Bennett and the same rationale for combining the optical modem of Piasecki. Using

the duplicity and synchronization of Piasecki with the security of Bennett, the combined system would suggest all of the limitations of claim 13. Moreover, the combination would teach the optical modems transmit and receive said synchronization signals having frame sync pulses and data pulses that act to lock a receive time domain to a transmit time timing domain in each QKD station (using Piasecki's PPL).

As per claim 14, Townsend teaches the limitation of "the timing channel and the public channel share a single physical connection between the two QKD stations" (column 2, lines 57-59) as in addition to this public discussion stage, the public channel is also used to calibrate the transmission system, Where (column 2, lines 18-21) calibration step includes transmitting a clock from the transmitter to receiver on the public channel.

With respect to claim 15, Townsend teaches the limitation of "the QKD system operates as a two-way system" (Column 6, lines 29-34) as after the key has been communicated on the quantum channel, the public channel is then used to complete the key distribution protocol. This step requires the use of an additional source at the receiver and an additional detector at the transmitter to enable two way communication.

As per claim 16, Townsend teaches the QKD operates as a one-way system (col. 7, lines 50-52).

As per claim 17, the combination of Townsend with Piasecki as combined in the rejection of claim 5 teaches one of the optical modem includes two phase lock loops and the other optical modem includes a phase lock look and a clock that generates sync signals.

As per claim 18, Townsend teaches the synchronization of the QKD stations is controlled by the controller of either QKD station (col. 7, line 57).

Claims 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Townsend et al. (US 5,675,648) and Bennett as applied to claim 11 and in further view of Piasecki.

As per claim 19, the combination of Townsend and Bennett are silent in disclosing one of the optical modems includes first and second phase lock loops (PLLs) coupled to the optical receiver and the optical transmitter located therein, and wherein the other optical modem includes a third PLL coupled to the optical receiver therein, and a clock coupled to the optical transmitter therein. Piasecki teaches this limitation as relied upon in the rejection of claim 5.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL R. VAUGHAN whose telephone number is (571)270-7316. The examiner can normally be reached on Monday - Thursday, 7:30am - 5:00pm, EST. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Korzuch can be reached on 571-272-7589. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. R. V./

Examiner, Art Unit 2431

/William R. Korzuch/

Supervisory Patent Examiner, Art Unit 2431